

- ☒ fossil energy
- ☐ environmental
- ☐ energy efficiency
- ☐ other

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SCRUBBER RESEARCH BOOSTS SULFUR DIOXIDE REMOVAL

States Impacted:

Pennsylvania and the other 25 states (AL, AZ, CO, FL, IL, IN, KA, KY, MI, MN, MS, MT, NV, NJ, NM, ND, OH, SC, TX, UT, WV, and WY) that have electric-utility generating stations using wet lime or limestone flue gas scrubbing systems.

Benefit Areas:

Environmental Performance, System Performance, and Operating Costs of Coal-fired Power Systems.

Participants:

Federal Energy Technology Center, Duquesne Light Company, Radian International, and EPRI

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Description

Radian International Ltd. has conducted full-scale, high-efficiency SO₂ removal tests at several commercial electric utilities that use wet fine gas desulfurization units, or "scrubbers." Radian has worked with the various utilities to evaluate chemical additives, namely, dibasic acid and thiosulfate, alone or in combination with mechanical modifications, such as forced oxidation, to remove SO₂.

Six power plants, representing a broad range of scrubber designs and levels of performance were involved in the testing: TECO's Big Bend Station (Research-Cottrell Dual-Loop Scrubber, forced oxidation); Hoosier Electric's Merom Station (Mitsubishi Cocurrent Tower, inhibited oxidation); SWEPCo's Pirkey Station (UOP Scrubber, inhibited oxidation); PSI's Gibson Station (Kellogg Horizontal Spray Tower, inhibited oxidation); NYSEG's Kintigh Station (Peabody Spray Tower); and Duquesne Light's Elrama Station (Venturi Scrubber).

Baseline testing was performed at each utility to document the current performance of the scrubber system. The testing included measurements of SO₂ collection efficiency, limestone utilization, sulfite oxidation, and solid byproduct dewatering properties. After retrofitting the existing scrubber by either the addition of chemical additives or mechanical modifications, Radian conducted parametric tests to evaluate improvements in system performance.

Goals

The test program was to identify retrofits capable of achieving 95+ percent SO₂ removal, to evaluate the costs of additional SO₂ removal for each set of operating conditions, and to obtain data for validating EPRI's FGDPRISM (Flue Gas Desulfurization Process Integration and Simulation Model), to predict removal efficiencies by estimating the interfacial area available for mass transfer.

Tangible Benefits

National: With about 25% of the existing coal-based generating capacity in the U.S. utilizing wet scrubbers, the benefits from this project were significant. Low capital cost modifications were demonstrated for a variety of scrubber systems, and, in fact, the improvements were made at incremental costs per ton of SO₂ removed below the current price of SO₂ allowances traded on the open market. The possibility for more stringent SO₂ regulations based on ambient fine particulate, visibility degradation, and mercury emission issues may be a factor even in enhancements for flue gas scrubber performance in the near future in controlling mercury from coal-fired utility boilers.

Regional/Local: Promising results from this test program led Duquesne Light to conduct a separate series of tests with thiosulfate from February through June 1998. In the past, Duquesne Light had used thiosulfate at its Elrama Station, but only in small quantities because of the expense of the reagent. However, a cheaper way to produce the additive has been developed at about one-sixth the cost. Tests using thiosulfate concentrations between 2,000 and 2,500 ppm, have increased the SO₂ removal performance to 91 percent (a 5 percent increase over design). In addition, scale buildup decreased an estimated 80 percent and lime usage decreased by 10 percent. Elrama could save as much as \$270,000 a year as a result of reduced scaling and lime use and the subsequent decrease in hauling and landfill costs. The improved removal efficiency also means that Duquesne Light has 13 percent, or \$84,000 more in SO₂ allowances available for use elsewhere in the company's system to address SO₂ reduction requirements.